Monsanto MATERIAL SAFETY DATA

MONSANTO COMPANY
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MONSANTO PRODUCT NAME

SKYDROL® 500B-4 FIRE RESISTANT HYDRAULIC FLUID

PRODUCT IDENTIFICATION

SKYDROL® 500B-4 fire resistant hydraulic fluid is a proprietary product. The formulation is a trade secret of Monsanto Company. All components of SKYDROL LD-4 hydraulic fluid appear on the Inventory of Chemical Substances published by the U.S. Environmental Protection Agency (EPA) under the authority of the Toxic Substance Control Act (TSCA).

Chemical Family:	Phosphate Esters with performance additives.
DOT Hazard Class:	This product is not classified as a hazardous material by the U.S. Department of Transportation.
Label Requirement:	Product Label
Reportable Quantity (RQ) Under U.S. EPA CERCLA Regulations:	Not Listed
U.S. Surface Freight Classification:	Hydraulic System Fluid, Other Than Petroleum
Hazardous Chemical(s) Under OSHA Hazard Communication Standard:	This product contains, as components, the substances listed below which are identified as hazardous chemicals under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200): Tributyl Phosphate, CAS Reg. No. 126-73-8 Dibutyl Phenyl Phosphate, CAS Reg. No. 2528-36-1

WARNING STATEMENTS

WARNING!
CAUSES IRRITATION TO EYES, SKIN, AND RESPIRATORY TRACT

PRECAUTIONARY MEASURES

Avoid contact with eyes, skin, and clothing.
Avoid breathing vapor or mist.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.

Emptied container retains vapor and product residue. Observe all labeled safeguards until container is cleaned, reconditioned or destroyed. DO NOT REUSE THIS CONTAINER.

EMERGENCY AND FIRST AID PROCEDURES

FIRST AID: IF IN EYES, immediately flush with plenty of water for at least 15 minutes. Call a physician.

IF ON SKIN, immediately flush with plenty of water. Remove contaminated clothing. Call a physician if irritation persists. Wash clothing separately before reuse.

IF INHALED, remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

OCCUPATIONAL CONTROL PROCEDURES

Eye Protection: Wear chemical splash goggles and have eye baths available where there is significant potential for eye contact.

Skin Protection: Wear appropriate protective gloves that provide a barrier and protective clothing to prevent skin contact. Consult glove manufacturer to determine appropriate type glove for given application. Wear a face shield and an apron that provides a barrier when splashing is likely. Wash contaminated skin promptly. Launder contaminated clothing and clean protective equipment before reuse. Wash thoroughly after handling.

Respiratory Protection: Handling this product at room temperature should not present an inhalation hazard since the material has a low vapor pressure. If the material is heated and released or aerosolized in a mist form in excessive concentrations, use NIOSH/MSHA approved respiratory protective equipment. Consult respirator manufacturer to determine the appropriate equipment type for given application. Respiratory protection programs must be in compliance with the OSHA Respiratory Protection Standard (29 CFR 1910.134).

Ventilation: No special ventilation is required besides good room ventilation. If heated material is released or aerosolized, local mechanical exhaust ventilation should be used at the source of air contamination.

Airborne Exposure Limits:

Product: Dibutyl Phenyl Phosphate
(CAS No. 2528-36-1)

OSHA PEL: None Established
ACGIH TLV†: None Established

Product: Tributyl Phosphate
(CAS No. 126-73-8)

OSHA PEL/TWA: 5 mg/m^3 (0.4 ppm) time-weighted average
ACGIH TLV/TWA: 2.5 mg/m^3 (0.2 ppm) time-weighted average
ACGIH TLV/STEL: 5 mg/m^3 (0.4 ppm)

FIRE PROTECTION INFORMATION

Flash Point:	320°F	***Method:***	Cleveland Open Cup
Fire Point:	350°F	***Method:***	Cleveland Open Cup
Auto Ignition Temperature:	750°F	***Method:***	ASTM D-2155

Extinguishing Media: Water spray, foam, dry chemical, carbon dioxide or any Class B extinguishing agent.

Special FireFighting Procedures: Firefighters or others exposed to products of combustion should wear full protective clothing including self-contained breathing apparatus. Equipment should be thoroughly decontaminated after use.

Unusual Fire and Explosion Hazards: Products of decomposition include hazardous carbon monoxide, carbon dioxide and oxides of phosphorus.

REACTIVITY DATA

Stability: Product is stable under ordinary conditions of handling and storage and under continued use up to approximately 250-275°F.

Materials to Avoid: Exposure to strong oxidizing agents may result in generation of heat and combustion products.

Hazardous Decomposition Products: Oxides of Phosphorus may form. No other uniquely hazardous decomposition products are expected. If the product is burned, as with any organic material, carbon monoxide and soot can be produced.

Hazardous Polymerization: Does not occur.

HEALTH EFFECTS SUMMARY

The following information presents both human experience and the results of scientific experiments used by qualified experts to assess the effects of SKYDROL 500B-4 fire resistant hydraulic fluid on the health of industrially exposed individuals and to support the Precautionary Statements and Occupational Control Procedures recommended in this document. To avoid misunderstanding, the data provided in this section should be interpreted by individuals trained in evaluation of this type of information.

Human Experience

Dermal contact and inhalation are expected to be the primary routes of occupational exposure to SKYDROL 500B-4 fire resistant hydraulic fluid. Eye contact with this product has been reported to produce marked pain in the eyes but has not been reported to cause damage to the eyes. Irritation in the form of drying and cracking of exposed skin may be caused by repeated or prolonged skin contact with this material. Exposure to aerosolized SKYDROL 500B-4 hydraulic fluid or vapors of SKYDROL 500B-4 hydraulic fluid produced at high temperatures has been reported to produce nose and throat irritation accompanied by coughing and wheezing. Inhalation of Tributyl Phosphate, a component of SKYDROL 500B-4, at concentrations above the recommended TLV may cause nausea and headache.

(Health Effects Summary Continued On The Next Page)

HEALTH EFFECTS SUMMARY (Continued)

Toxicological Data

Data from Monsanto studies indicate the following:

SKYDROL®500B-4 Fire Resistant Hydraulic Fluid

Oral LD_{50} (Rat): 2,2,00 mg/kg, Slightly Toxic
Dermal LD_{50} (Rabbit): Greater than 7,940 mg/kg, Practically Nontoxic
Eye Irritation (Rabbit): (FHSA) 2.4 on a scale of 110.0, Slightly Irritating
Skin Irritation (Rabbit): (FHSA) 2.5 on a scale of 8.0, Slightly Irritating
Vapor Inhalation 4-hr LC_{50} (Rat): Greater than 4.5 mg/l. No mortality was observed at greater than 4.5 mg/l, the highest atmospheric concentration achievable in this study.

Patch testing of 53 human volunteers with SKYDROL 500B-4 hydraulic fluid produced no positive reactions following initial application; 14 out of 53 subjects displayed reactions during subsequent induction exposes. No reaction was observed on challenge. SKYDROL 500B-4 fluid is not considered a primary irritant or a dermal sensitizing agent.

Components

Data from Monsanto studies and from the available literature on the components of SKYDROL 500B-4 hydraulic fluid which have been identified under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200) are discussed below:

Dibutyl Phenyl Phosphate

Patch testing of 50 human volunteers with Dibutyl Phenyl Phosphate produced positive reactions in 2 out of 50 subjects following the first two applications; no positive reactions were observed during subsequent repeated induction exposures. No reaction was observed on challenge. Dibutyl Phenyl Phosphate is not considered a primary irritant or a sensitizing agent.

A neurotoxicity study was conducted with Dibutyl Phenyl Phosphate in adult hens. Adult hens were dosed orally with a single dose of 1.34 g/kg. This dose was repeated 21 days later. No gross signs of neurological effects and no microscopic evidence of demyelination in brain, spinal cord or sciatic nerve were observed.

Dibutyl Phenyl Phosphate was applied to the intact and abraded skin of rabbits at dosages of 10, 100, and 1000 mg/kg/day for 6 hours/day, 5 days/week for 3 weeks. Dermal irritation was observed at the site of application. Significant reductions of plasma cholinesterase activity were determined for high-dose males and females and for mid-dose males. Slight reductions in brain and erythrocyte cholinesterase activities were determined for high-dose males and females and for high-dose males, respectively. No other adverse biochemical, hematological or urinalysis effects were observed. The systemic no-effect level was considered to be 10 mg/kg/day.

Dibutyl Phenyl Phosphate was administered to rats at dietary concentrations equivalent to 50, 150 or 500 mg/kg/day for 90 days. Decreased body weight gains and food consumption were observed at the high-dose exposure level. Increased liver weight/liver-to-body weight ratios and decreased lung weights were observed in the mid- and/or high-dose exposure groups. Hematologic parameter alterations were reported in the high-dose group. Histopathologic lesions were noted in liver, kidneys, bladder, and ovaries of most treatment groups.

In a subsequent 90-day study, rats were administered Dibutyl Phenyl Phosphate in the diet of a dosage of 5 mg/kg/day. No adverse hematological or histopathological effects and no changes in plasma or erythrocyte cholinesterase activity were observed.

(Health Effects Summary Continued On The Next Page)

HEALTH EFFECTS SUMMARY (Continued)

Dibutyl Phenyl Phosphate (Continued)

No teratogenic or fetotoxic effects were observed in the offspring of rats administered Dibutyl Phenyl Phosphate by gavage at a dosage of 3, 30 or 300 mg/kg/day on days 6 through 15 of gestation. No maternal toxic effects were observed at any treatment level.

Dibutyl Phenyl Phosphate was evaluated for mutagenic or genotoxic potential in the following systems: microbial assays with five *Salmonella* strains and one strain of *Saccharomyces* yeast; *in vitro* induction of L5178Y TK mouse lymphoma cell point mutations; and a hepatocyte primary cultura/DNA repair assay. No mutagenic activity was observed in any of these assays.

Tributyl Phosphate

Single intraperitoneal injections of Tributyl Phosphate at dosages of 850 to 1,000 mg/kg were reported to cause paralysis in mice.

A neurotoxicity study was conducted with Tributyl Phosphate in adult hens. Adult hens were dosed orally with a single dose of 1.84 g/kg. This dose was repeated 21 days later. No gross signs of neurological effects and no microscopic evidence of demyelination in brain, spinal cord or sciatic nerve were observed.

Tributyl Phosphate was administered to rats by gavage at doses of 0.28 and 0.42 ml/kg/day for 14 consecutive days. Decreased body weights were reported in all treatment groups at 7 days and in low-dose females at 14 days. Conduction velocity of the caudal nerve was reduced in high-dose males. Increases in refractory periods of caudal nerve were reported in high- and low-dose groups. Morphological alterations in unmyelinated fibers were reported in the high-dose groups. No axonal degeneration was observed.

Rats were administered Tributyl Phosphate by gavage at doses of 0.14 to 0.42 ml/kg/day for 14 consecutive days. Alterations in organ weights and hematological and biochemical parameters were reported in low- and/or high-dose treatment groups. One of 4 male rats in the high-dose group examined for histopathological changes was reported to show degenerative changes in the seminiferous tubules. No other histopathological abnormalities were observed.

Reduced body weights, reduced feed consumption and altered organ weights with decreased serum enzyme and glucose levels and increased cholesterol and/or urea nitrogen levels were reported in male rats fed dietary concentrations of 0.5% and 1.0% Tributyl Phosphate for 10 weeks. Blood coagulation times were also prolonged following this *in vivo* treatment with Tributyl Phosphate, brain cholinesterase activity was significantly elevated. Activities of serum and liver cholinesterase did not change. Following *in vitro* treatment of rat brain and liver homogenates and serum with Tributyl Phosphate, no change in cholinesterase activities were reported.

Rats were fed diets containing Tributyl Phosphate at levels of 8, 40, 200, 1000 or 5000 ppm for 90 days. Hematological, biochemical, and coagulation parameter changes and increased liver weights were reported in the high-dose animals. Urinary bladder hyperplasia was observed among male and female rats at 5000 ppm and among males given 1000 ppm. In a separate study, male and female rats given Tributyl Phosphate by gavage at levels of 0.20 and 0.30-0.35 mg/kg/day 5 days/week for 18 weeks were also reported to exhibit urinary bladder hyperplasia.

Another feeding study was conducted in rats with Tributyl Phosphate at a dietary level of 0.5% for 9 weeks. Decreased body weights and altered organ weights with increased urea nitrogen levels were reported. No adverse effects on hematological parameters, blood coagulation time, or serum enzyme activities were reported.

Cholinesterase activities of human red cell hemolysate (substrate concentration $1x10^{-3}$ M acetylcholine) and human plasma (substrate concentration $1x10^{-2}$ M acetylcholine) were reported to be inhibited by Tributyl Phosphate *in vitro*.

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HEALTH EFFECTS SUMMARY (Continued)

Dibutyl Phosphate (Continued)

Tributyl Phosphate administered intraperitoneally to rats at dosages ranging from 16 to 226 mg/kg produced a dose-dependent increase in serum -glucuronidase activity. No effect on serum cholinesterase activity was reported at any dose level tested.

No mutagenic activity was reported in microbial assays using *Salmonella* and *Escherichia* organisms or in a sex-linked dominant lethal assay in *Drosophila*.

Following a single oral dose (14 mg/kg) of radiolabeled Tributyl Phosphate to male rats, 50%, 10% and 6% of the administered radiolabel was reported to be excreted in urine, exhaled air, and feces, respectively, within one day. Male rats given a single intraperitoneal dose (14 mg/kg) of radiolabeled Tributyl Phosphate were reported to excrete 70%, 7% and 4% of the administered radiolabel in urine, exhaled air, and feces, respectively, within one day.

Additional Information

A Threshold Limit Value (TLV†) has been established by the American Conference of Governmental Industrial Hygienists for Tributyl Phosphate. For further information on Tributyl Phosphate, please refer to the current edition of the *Documentation of Threshold Limit Values*.

PHYSICAL DATA

Appearance:	Clear, purple, oily liquid
Boiling Point @ 267 mm Hg (Based on Vapor Pressure Data):	Approximately 257°F
Pour Point:	Less than −80°F (Maximum)
Specific Gravity @ 25/25°C:	1.052-1.060
Viscosity @ 100°F:	10.8-11.6 cs
Refractive Index, n 25/D:	1.446-1.474

Note: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specification items.

SPILL, LEAK & DISPOSAL INFORMATION

Emergency Spill and Leak Information: Absorb spilled or leaked material on clay, sawdust, or other absorbent material.

Disposal Information: Waste should be incinerated or disposed of in a hazardous waste landfill. Either disposal route should be in accordance with all local, state or federal regulations. This material should not be spilled, dumped, rinsed, or washed into sewers or public waterways.

ADDITIONAL COMMENTS

Environmental Toxicity Information:

SKYDROL 500B-4

48-hr EC_{50} *Daphnia magna:* 6.5 mg/l, Moderately Toxic
48-hr EC_{50} Algae (Chlorophyll): 7.1 mg/l, Moderately Toxic
96-hr EC_{50} Algae (Cell Count): 8.9 mg/l, Moderately Toxic
96-hr LC_{50} Fathead minnow: 3.0 mg/l, Moderately Toxic
96-hr LC_{50} Rainbow trout: 2.6 mg/l, Moderately Toxic

Dibutyl Phenyl Phosphate

96-hr TC_{50} Bluegill sunfish: Estimated to be between 1 and 10 ppm, Moderately Toxic
14-Day LC_{50} Rainbow trout: 2.4 mg/l

Daphnia magna were exposed to Dibutyl Phenyl Phosphate concentrations of 0.014, 0.028, 0.055, 0.092 and 0.25 mg/l through one generation (21 days). Increased mortality, reductions in the total length of *Daphnia* at 7 days, and reductions in the percent of gravid females were observed at 0.25 mg/l. The maximum acceptable toxicant concentration was greater than 0.092 mg/l and less than 0.25 mg/l.

Rainbow trout eggs were exposed to Dibutyl Phenyl Phosphate concentrations ranging from 0.007 to 0.110 mg/l. No treatment-related effects were observed on hatchability of eggs or on growth and survival of the fry. The maximum acceptable toxicant concentration was greater than 0.110 mg/l.

Dibutyl Phenyl Phosphate had a primary degradation rate of greater than 95% in a semicontinuous activated sludge test; this material was classified as readily degraded. In a river die-away study, Dibutyl Phenyl Phosphate was classified as being readily degraded.

Tributyl Phosphate

Tributyl Phosphate was evaluated in a semi-continuous activated sludge test, the Thompson-Duthie-Sturm biodegradation assay and in a river die-away test. Based on results from these assays, Tributyl Phosphate was classed as readily degraded.

Product Qualifies under the following specifications:

BMF 3-11F, Type IV, Class 2, Grade A
DMS 2014C, Type IV, Class 2
LAC MS C-34-1224, Type IV
SAE AS 1241A, Type IV, Class 2
NSN 9150-01-056-4883 (lqt)

Monsanto MATERIAL SAFETY DATA

DATE: 4/28/86 **SUPERSEDES:** 12/21/84

MSDS NO.: M00006729

FOR ADDITIONAL NON-EMERGENCY INFORMATION, CONTACT:

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(INCLUDING THIS COVER PAGE)

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